

Final Review Sheet

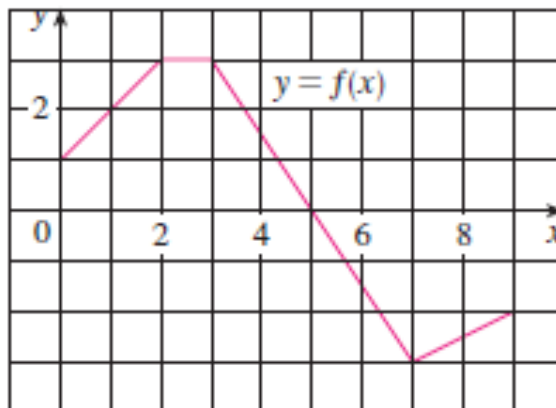
- Which function is longer on the interval $[0, 2]$: $f(x) = x^2$ or $g(x) = x^3$?
- Find the indefinite integral of
 - $\int 3x^4 + 2 \, dx$
 - $\int (5\sqrt{x} - 3x) \, dx$
- Evaluate the following definite integrals (without using the calculator function).
 - $\int_0^{\frac{\pi}{2}} \cos(x) \, dx$
 - $\int_1^2 (3x + x^3) \, dx$
- Calculate the exact area bounded by the curves $f(x) = (x-2)^2$ and $g(x) = -x^2 + 4$.
- Find the volume of the solid created when the area bounded by $y = x^2 - 4$ and $y = 0$ rotated about the x-axis.
- Find the volume of a solid created when the area bounded by $y = \sqrt{x-2}$, $y = 0$, and $x = 5$ is rotated about the x-axis.
- At each point (x, y) on a given curve, the slope is given by $6x^2 - 2x + 3$. Find the equation of the curve if the curve passes through the point $(1, 3)$.
- If $y^2 - 2x = 3$, then $\frac{dy}{dx}$ at the point $(3, 3)$ is?
- Evaluate:
 - $\lim_{x \rightarrow 0} \frac{24x^3 - 3x}{12x^3 + x}$
 - $\lim_{x \rightarrow +\infty} \frac{24x^3 - 3x}{12x^3 + x}$
- The equation of the tangent line to the curve $y = \frac{x+2}{2x-1}$ when $x = 3$ is?
- What are **all** values of x for which the graph of $y = 6x^2 + \frac{x}{2} + 3 + \frac{6}{x}$ is concave downward?
- Find the derivative of $f(x) = \frac{x^2 - 1}{2x}$.
- A particle moves along the x-axis so that at any time t its position is given by $x(t) = \frac{1}{2} \sin(t) + \cos(2t)$. What is the acceleration of the particle at $t = \pi/2$?
- If $f(x) = e^x \ln(x)$, then $f'(e) = ?$

15. The graph of f is shown. Evaluate each integral by interpreting in terms of areas.

a. $\int_0^2 f(x) dx$

b. $\int_2^5 f(x) dx$

c. $\int_0^5 f(x) dx$



16. The base of a 13 foot ladder slides away from a wall at a rate of 3 feet per second. At what rate is the top of the ladder sliding down the wall at the moment that the base of the ladder is 12 feet from the wall?

17.

For each of the following functions, use the definition of derivative to find $f'(x)$.

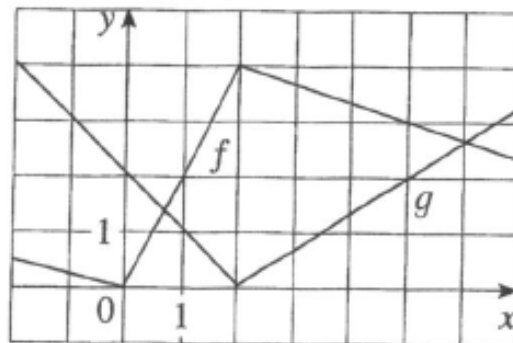
Recall: $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

18. $f(x) = 2x^2 - 8x + 5$

19. $f(x) = \sqrt{3x+1}$

20. If f and g are the functions shown below. Let $h(x) = f(g(x))$ and $s(x) = f(x)g(x)$.

Find: $h'(1)$ and $s'(1)$



21. The following table records the values of $f, f', g,$ and g' at $x=1, x=2,$ and $x=3$.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	2	1	2	3
2	5	4	3	4
3	0	6	-1	-2

If $n(x) = \frac{f(x)}{g(x)}$, $h(x) = f(g(x))$, find the value of each of the following: a) $n'(2)$ b) $h'(1)$

Questions 22 through 28 refer to the graph of $y = f(x)$ shown to the right.

22. $\lim_{x \rightarrow 1^-} f(x) =$

23. $\lim_{x \rightarrow 1^+} f(x) =$

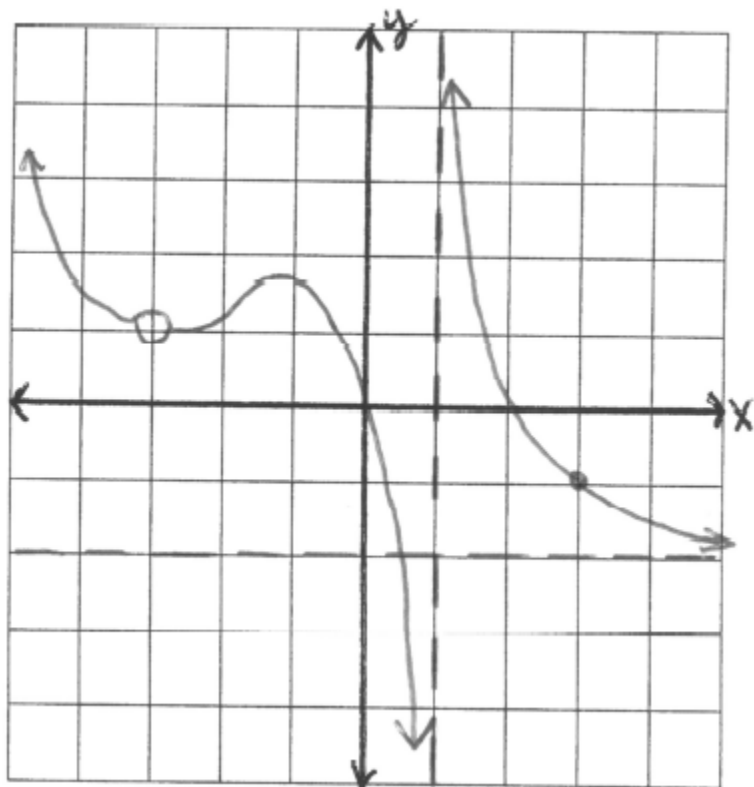
24. $\lim_{x \rightarrow 1} f(x) =$

25. $\lim_{x \rightarrow -3} f(x) =$

26. $\lim_{x \rightarrow 3} f(x) =$

27. $\lim_{x \rightarrow -\infty} f(x) =$

28. $\lim_{x \rightarrow \infty} f(x) =$



29. Write the equation of the line tangent to $y = 3x^2 - 2x + 1$ when $x = -1$.
30. An object moves along a line so that its position at time t is given by $s(t) = 2t^3 - 15t^2 + 24t - 10$ where $t \geq 0$.
- What is the object's position at time $t = 3$?
 - What is the object's velocity at time $t = 3$?
 - What is the object's acceleration at time $t = 3$?
 - Is the object speeding up or slowing down at $t = 3$? Justify your response.
 - When is the object at rest?
 - When is the object moving right?
 - How far does the object travel in the first 3 seconds?
31. Two hikers begin at the same location and travel in perpendicular directions. If the first hiker travels north at 4 mph and the second hiker travels west at 7.5 mph, at what rate is the distance between the hikers changing two hours after they begin hiking?
32. Write the equation of the tangent to $x^2 - xy = y^2 + 1$ in the first quadrant when $y = 1$.